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(71) Applicant *(for all designated States except US)*: NOVUS INVESTMENTS LIMITED [GB/GB]; Manchester House, 3rd Floor, 86 Princess Street, Manchester M1 6NP (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)* : PICKFORD, Keith, Graham [GB/GB]; 14 Woodhall Avenue, Park Lane, Whitefield, Manchester M25 7QF (GB).

(74) Agent: ATKINSON, Peter, Birch; Marks & Clerk, Suite 301, Sunlight House, Quay Street, Manchester M3 3JY (GB).

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(54) Title: PROCESS FOR MANUFACTURING A SHAPED FOOD PRODUCT BY FORMING A GEL COMPRISING A CELLULOSE GUM, ALGINATE AND A GELATION AGENT

(57) Abstract

A process for the manufacture of a shaped food product comprises mixing a water soluble alginate and a cellulose gum with the uncooked or partly cooked product, and mixing a non-toxic substance with the food water soluble alginate mixture. The non-toxic substance is one that reacts with the soluble alginate to form a water insoluble gel. The mixture is formed into a desired shape before completion of the water insoluble gel-forming reaction. The product thus obtained has good microwave stability.

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PROCESS FOR MANUFACTURING A SHAPED FOOD PRODUCT BY FORMING A GEL COMPRISING CELLULOSE GUM, ALGINATE AND A GELATION AGENT

This invention relates to the manufacture of a food product.

One of the major problems in the manufacture of shaped food products is ensuring that the food product retains its shape during storage in the uncooked or partially cooked condition and also during and after cooking e.g. by grilling, baking or microwave irradiation. For example potato chips may be shaped from pre-cooked mashed potato, the advantage being that such chips can be of uniform shape and consistency. However, the chips prior to final cooking do not have much strength and can easily be broken during handling.

It is convenient to store food products, such as potato chips in the frozen condition. It is highly desirable, particularly in so-called "fast food" catering establishments to subject the frozen product to the final cooking step for example in a microwave oven, and not wait until the product has unfrozen. It often happens, however, that a sharp heating of a frozen product particularly one of low strength such as frozen mashed potato can cause the product to rupture.

The invention has been made with these problems in mind.

According to the invention there is provided a process for the manufacture of a shaped food product comprising admixing a water soluble alginate, a cellulose gum, and a non-toxic substance with the uncooked or partially cooked product, said substance being one that reacts with the soluble alginate to form a water insoluble gel, and forming the product into a desired shape before completion of the water insoluble gel-forming reaction.

With the invention the strength of the shaped food product is increased by virtue of the insoluble alginate gel distributed therethrough. The amount of alginate gel present in the food product is chosen having regard to the inherent strength of the food product. Thus low strength food products may require a greater proportion of alginate gel than food products that have better mechanical stability. It is, of course, desirable not to use more alginate gel than is necessary so that the flavour of the food product is not affected. Generally an amount of alginate in the range 0.5 to 2.0% by weight based on the total weight of the food product will be appropriate in most cases. The cellulose gum will generally be used in an amount of

1 to 6% by weight (preferably 2-3% by weight) and the non-toxic substance which reacts with the alginate to form the water-insoluble gel will be used in an amount up to 1%.

Any soluble alginate can be used in the present invention provided it is not toxic and preferably does not affect the flavour of the food product. Alginates which are particularly useful are those produced from seaweed.

In a preferred embodiment of the invention the insoluble alginate gel is a calcium alginate formed from a water soluble alginate such as sodium alginate and a non-toxic calcium compound, e.g. calcium carbonate, as the gelling agent. Calcium alginate gels contain free water molecules within the gel network. Sudden heating of the gel, for example in a microwave oven, can superheat the water molecules in the gel and the resultant sudden expansion of the water within the gel can rupture the gel structure even to the extent of breaking the chemical bonds within the gel. So while the alginate gel will maintain the food product in its desired shape during handling and storage it might not reliably sustain that shape when the product is cooked, particularly if it is subjected to a sharp rise in temperature for example as may happen if the frozen product is heated in a microwave oven. The cellulose gum ensures that as far as possible the product shape is maintained during cooking. Cellulose gums such as methyl cellulose, hydroxy propyl methyl cellulose and hydroxybutyl methyl cellulose can be used in the invention. When the dissolved cellulose gum is heated beyond its incipient gelation point, usually around 50°C, it forms a gel. Further heating increases the gel strength. For example the viscosity of the cellulose gum solution just prior to gelation may be of the order of 40 cP. After gel formation and further heating from about 50°C to about 55°C the viscosity may increase to a value of the order of 130 cP. The viscosity of the cellulose gel drops to some extent on cooling but not below 100 cP. So even if the cooked food product is allowed to go cold it will still have some strength imparted to it.

The combined effect of the alginate gel and the cellulose gum, therefore, provides adequate strength to the food product during all stages between production and final consumption.

Viscosity can be increased by the interaction of cellulose gums

and starches. It can be advantageous, therefore, to include starch in the composition in order to obtain the benefit of that interaction.

Food products produced in accordance with the invention may comprise a foodstuff of vegetable or animal origin. Generally the foodstuff will have a particle size up to 10 mm, e.g. up to 8 mm. Examples of particulate foodstuffs and the shaped products which may be formed therefrom are shown in the following list.

Particulate Foodstuff	Product
Poultry	Steaklet, Nugget
Meat	Steaklet, Meat Balls
Potato	Chips, Fritters, Cakes
Onion	Onion Rings
Fish Mince	Scampi-like products, Fingers, Cakes
Mushroom	Reformed Mushroom Products
Peas	Fritters
Mixed Vegetables	Fritters

The shaped food product may for example be prepared by extrusion or moulding.

For producing the product by extrusion, the various ingredients may be mixed together in a static mixer, and the mixture extruded through a suitable extrusion nozzle. The gelling agent is introduced into the mixer prior to the mixture being passed through the extrusion nozzle. After extrusion, the product may be cut to length as desired. Extrusion may be used, for example, for producing chips and onion rings.

Injection moulding (of a mixture including the gelling agent - e.g. as produced by a static mixer) may be used, for example, for producing mushroom-shaped products (from particulate mushroom material) and scampi-like products (from fish mince).

The process also lends itself to forming products without static mixing. Examples of such products include fritters such as vegetable fritters, scrambled egg and bacon fritters, and mushy peas and ham fritters.

The shaped food products produced in accordance with the invention have good microwave stability. The thermal gelation in the core prevents moisture migration in frozen and chilled products on microwave recovery.

The invention is illustrated by the following Example.

EXAMPLE

A batch of potatoes were peeled and boiled until soft enough to mash. After mashing the potatoes were allowed to cool.

The following ingredients were then mixed with the mashed potato in a screw blade mixer for 3 minutes (percentages by weight based on the weight of potato)

	%
Methyl Cellulose (A4M)	1.0
Sodium Alginate	1.0
Modified Starch	1.0
Ascorbic Acid	0.75
Glucono-D-Lactone	0.25

A slurry was formed from calcium carbonate and water in the proportion 1.6:1 wt/wt. The slurry was then added to the mashed potato mix such that the calcium carbonate was present in an amount of 0.8% by weight based on the weight of mashed potato mix. The combined materials were passed through a static mixer to disperse the calcium carbonate through the mashed potato mix. The materials are then immediately formed into the desired shape.

The formation of alginate gel begins as soon as the calcium carbonate is brought into contact with the sodium alginate mixed with the mashed potato and is completed in about two minutes. Any attempt to shape the product after formation of the gel will tend to break up the gel structure. Thus the shaping step was carried out as soon as possible and as quickly as possible after the addition of the calcium carbonate slurry, for example after about one minute.

The material was shaped into chips which were found after cooking to have the same texture as chips formed by subdividing

uncooked potato and then frying the potato pieces.

It can happen that freezing of potato starch ruptures the potato cell structure. Once the cell structure has been damaged in this way, subsequent cooking, for example by frying or microwave heating cannot produce a crisp product. If it is intended that the shaped product should be crisp when cooked and if the product is going to be stored in the frozen condition it is desirable to coat the product with a crisping agent. Coating may be carried out at any stage prior to cooking of the product. The coating may have the following composition

	% by weight
Methyl Cellulose	from 0.2 to 1.0
D-Xylose	1.25
Lecithin	1.0
GMS	0.5
Acetylated Corn Starch	Balance (to 100%)

The above mix is formed into an emulsion by combining with water in the ratio of 1:2 water to dry mix; and the products are dipped therein. If desired a hard crumb, such as RHM PE grade can be applied to the coating.

The invention is not restricted to the above described embodiments and many variations and modifications can be made.

CLAIMS

1. A process for the manufacture of a shaped food product comprising admixing a water soluble alginate, a cellulose gum, and a non-toxic substance with the uncooked or partially cooked product, said substance being one that reacts with the soluble alginate to form a water insoluble gel, and forming the product into a desired shape before completion of the water insoluble gel-forming reaction.

2. A process as claimed in claim 1 wherein the alginate is present in an amount of 0.5 to 2.0% by weight based on the total weight of the food product.

3. A process as claimed in claim 1 or 2 wherein the alginate has been produced from seaweed.

4. A process as claimed in any one of claims 1 to 3 wherein said alginate is a sodium alginate.

5. A process as claimed in any one of claims 1 to 4 wherein said non-toxic substance is a calcium compound.

6. A process as claimed in claim 5 wherein said calcium compound is calcium carbonate.

7. A process as claimed in any one of claims 1 to 6 wherein said gum has an incipient gelation point of about 50°C.

8. A process as claimed in any one of claims 1 to 7 wherein the forming of the food product into the desired shape is by extrusion.

9. A process as claimed in any one of claims 1 to 7 wherein the forming of the food product into the desired shape is by injection moulding.

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 92/01557

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A23L1/0532; A23L1/0534; A23L1/217

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	A23L

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category[10]	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	US,A,3 891 776 (R.P. CARPENTER) 24 June 1975 see claims 1-3,6,7 see column 1, line 34 - line 43 see column 2, line 21 - line 61 see column 3, line 6 - line 14 see examples ---	1-5,8
X	US,A,4 436 759 (D.M. TRILLING) 13 March 1984 see claims 1-9,18,19,21,23 see column 1, line 33 - column 2, line 41 see column 2, line 51 - column 3, line 20 see column 3, line 40 - column 4, line 18 see column 4, line 56 - column 6, line 10 --- -/--	1-6,8,9

[10] Special categories of cited documents:

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
20 NOVEMBER 1992	10.02.93
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	VUILLAMY V.M.L.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	WO,A,9 014 019 (NADREPH LTD) 29 November 1990 see page 4, paragraph 1 -paragraph 6; claims 1-4,9,10,12 see page 10, paragraph 2 -paragraph 3 see page 11, paragraph 3 see page 12, paragraph 4 - page 14, paragraph 1 see example 10	1-6
X	AU,B,505 422 (UNILEVER LTD) 22 November 1979 see claims 1,2 see page 3, line 25 - page 4, line 5 see page 4, line 18 - page 5, line 12 see examples 1,3,4	1-5,8,9

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9201557 SA 64647

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 20/11/92
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-3891776	24-06-75	None		
US-A-4436759	13-03-84	CA-A-	1185115	09-04-85
WO-A-9014019	29-11-90	AU-A-	5740490	18-12-90
		EP-A-	0472609	04-03-92
		JP-T-	4505255	17-09-92
AU-B-505422	22-11-79	AU-A-	1602376	07-10-76